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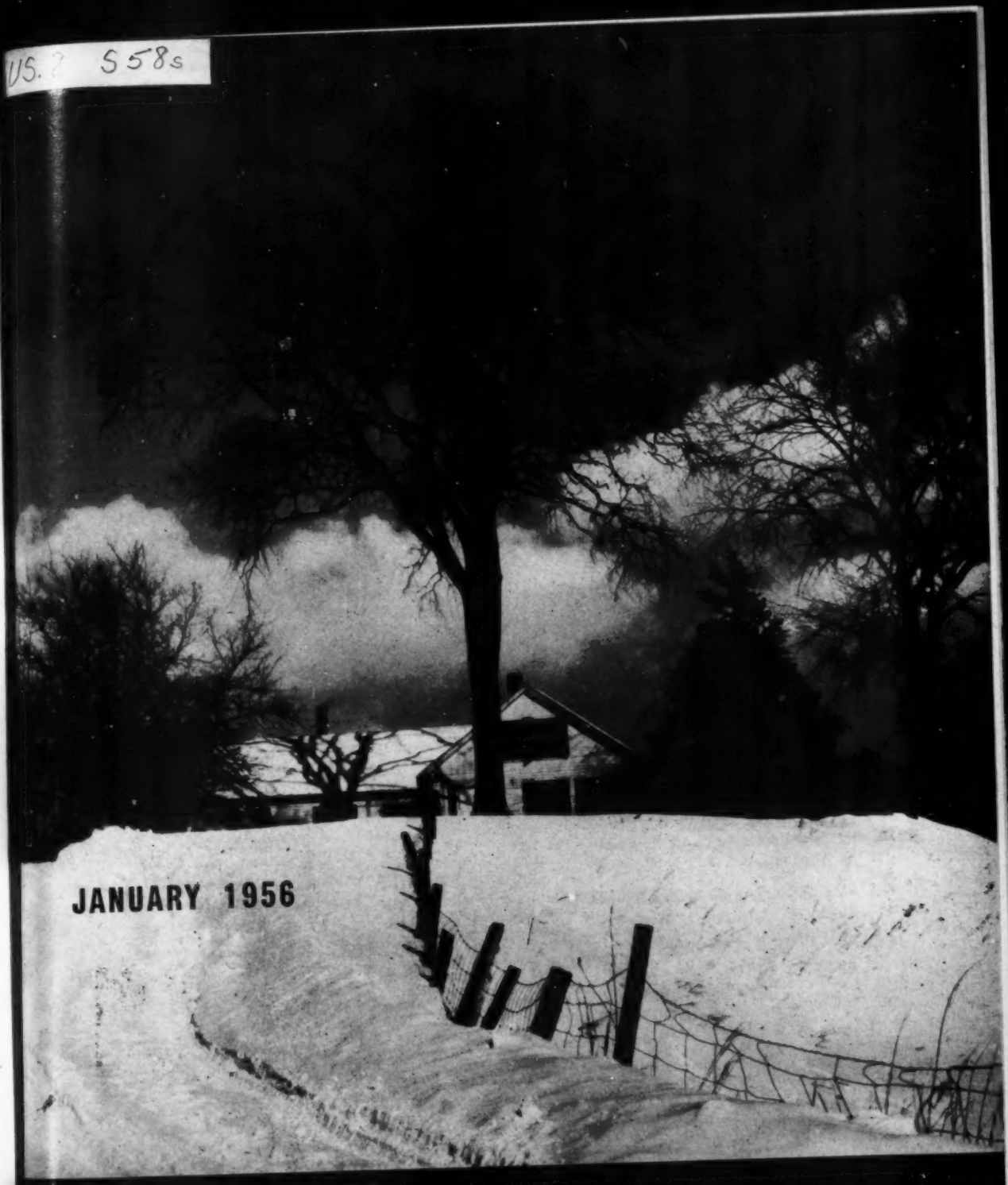

JANUARY 1956

SOIL CONSERVATION

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SOIL CONSERVATION

JANUARY 1956

VOL. XXI—NO. 6

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

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OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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WELLINGTON BRINK
Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, July 18, 1955. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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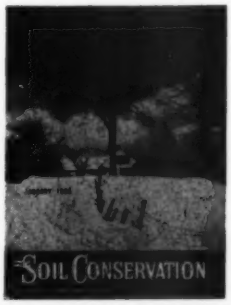
TIMBER SURVEY.—The Nation's timber requirements are expected to be so high by the end of the century that timber growth will need to be from 70 to 120 percent greater than now.

Improved forest management at recent rates of progress appears unequal to providing a balance between cut and growth at the year 2000. This means that further acceleration in forest management and production on both public and private lands must be attained if anticipated demands are to be met.

These basic findings are in the preliminary Timber Resource Review. This report represents the most complete survey of timber resources ever made, and required over 3 years in planning and field survey. It was made by the USDA's Forest Service in cooperation with State Foresters, other State agencies, forest industries, and other public and private organizations.

Editors are invited to reprint material originating in this magazine.



FRONT COVER.—The chill beauty of February settles on this farm house in Coos County, N. H.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

The Editor Makes a Final Report

Here are cited a few of the things this magazine has tried to do in two busy decades under a single editorial direction.

IT is 20 years and 6 months since I brought out the first issue of SOIL CONSERVATION Magazine in August 1935.

They have been eventful, exciting, incredible years.

My Editor's post has afforded an unusual vantage point from which to view the National scene. Within this journal's pages has been captured something of the pulsation of our times, as our land has known depression, drought and dust bowl, flood and hurricane, war and threats of war, and also the blessings of prosperity.

Here in our magazine's lengthening files is perhaps the only complete and coherent history of the modern movement to conserve our soil and water. Here, too, is the story of a great people—stewards of the land—moving together toward high destiny through their own unique soil conservation districts.

This periodical has functioned as the voice—the "official organ"—of the Soil Conservation Service. It has endeavored to speak authoritatively, clearly, and with scientific accuracy. At the same time, it has sought to be readable and stimulating.

The magazine has been able to attract the work of many of the best writers in the broad field of conservation. Its constant aim has been to serve the whole dynamic ecological objective.

I am immeasurably grateful for the extraordinary support I have had as Editor from the Service, from our readers, and from our contributors.

By latest count, there have been 246 monthly issues, approximately 6,000 illustrations, and something like 1,000 authors, many of whom have by-lined a number of articles each.

In thoughtful retrospect, it would seem that our writers have had a great deal to do with reshaping the American concept of proper land use, with remodeling the public's conservation thinking, and with seeding ideas that have taken vigorous root in this country and abroad.

I have a notion that the magazine's scheme of distribution has aided its effectiveness. The press run has never been very large—usually about 6,500 free copies and 3,500 paid subscriptions. With few exceptions, each of the free copies has gone to a hand-picked destination where it has been read by an entire staff rather than a single individual. Thus, our journal has been able to reach a surprising number of specialists on college and government payrolls, as well as a considerable army of students, teachers, textbook writers, editors, and administrators. Its circulation reaches around the world. Much of its material has been picked up and reprinted and its impact thus has been magnified. Many libraries are in the habit of binding the volumes permanently. Out of the

magazine have developed whole books or parts of books. Excellent photographs, selected from a large flow from "the field," have become a tradition.

All of us who have had a hand in making SOIL CONSERVATION Magazine have been pleased to note the high quality of writing. Another point of gratification has been our occasional discovery of a celebrity before he has attained wide acclaim. Kenneth Davis wrote for us as early as 1936, then established himself as a novelist. Dr. Selman A. Waksman contributed "The Living Soil" and "Humus and Soil Conservation" — remember? — and later became world famous for his work in antibiotics. Dr. Paul S. Sears, a veteran in our columns, will soon take office as president of the American Association for the Advancement of Science. Dr. W. C. Lowdermilk, an oldtime member of our group, now is an international conservation authority and an author and lecturer of note. Then, of course, there is the "father of soil conservation," Hugh H. Bennett himself—for so long a regular contributor.

These are but a few of the magic names. It has often remained, however, for some young or little known technician to come up with a particularly noteworthy manuscript.

Sprinkled through the twenty-plus volumes are sparkling gems—perhaps a hundred—that deserve special recognition. All of us have our favorites. Each carries its own particular charm. I think of three which will do as samples—

"Kudzu is This Farmer's Friend" by the late E. M. Rowalt. A verbatim report of the experience of a Southern Negro in feeding his old mule.

"Woodland Caribou in Minnesota" by William T. Cox. An adventure in combatting the extinction of a wildlife species.

"The Death of a Great City" by M. L. Kirschner and Malcolm Orchard. A dramatic recital, with lesson appended, from New Delhi, India.

The war generated many a mellifluous slogan. Who could ever forget "Selective service for every acre" . . . "The flag is on the plow" . . . "Acres are aces."

Peace brought an almost equal crispness of phrase and title. How intriguing, for example, "The Hills are Falling Down"—the tag on an article about the Palouse country!

In 1935 SOIL CONSERVATION Magazine was something of a pioneer. It is credited with having been the first periodical in the world entirely devoted to the conservation of soil and water. Now, happily, it has been joined by a numerous family of top-notch contemporaries launched by the States, by other countries, and by various organizations that have come into the conservation field.

But there is always pioneering to do. And our magazine under a new Editor will find fresh trails to blaze, new horizons to explore, and can be depended on to improve the value of its service month by month and year by year. I am so confident of this that I am happy to write a newsman's "thirty" now to this phase of my own career.

Soon I shall be on my way to Thailand for the International Cooperation Administration. There I shall be doing what I can to help that Nation develop its agricultural extension information program.

Thanks for everything—and best wishes to my successor and those who will be working with him in the years to come!

—WELLINGTON BRINK

——30——

Water Laws

BETWEEN January and July of 1955, 20 States passed new legislation, or amended existing legislation, to further cooperation between local agencies and the Secretary of Agriculture in carrying out the provisions of Public Law 566, the Watershed Protection and Flood Prevention Act of 1954.

The States passed 37 different laws during the 7-month period. Most of them were designed to meet the requirements of the new

Note.—This summary is based on a study made by Kirk M. Sandals, of the Soil Conservation Service, and L. M. Adams, of the Office of the General Counsel, U. S. Department of Agriculture.

federal policy by authorizing local agencies to carry out, maintain, and operate watershed works of improvement.

Local agencies defined in the federal law may be States, political subdivisions of States, such as counties, towns, townships and boroughs, soil conservation, watershed, flood prevention or drainage districts, and similar agencies.

Eight States passed legislation pertaining to State agencies. California authorized the State Water Resources Board to pay for the cost of lands, rights-of-way, and easements. Vermont authorized the State Water Conservation Board to build, operate, and maintain structures. New Hampshire appropriated funds to the Water Resources Board to assist in carrying out watershed projects.

Kansas and Minnesota established a Water Resources Board, and North Carolina created a Board of Water Commissioners. Oklahoma set up a study committee on water problems, and Wisconsin authorized a study of watershed management by the Joint Legislative Council.

Four States passed legislation pertaining to State political subdivisions. Connecticut authorized cities, towns, and boroughs to cooperate with the Federal Government in watershed projects. Nebraska gave certain counties the right to appropriate funds for and to carry out flood control projects. Maryland authorized Worcester County to undertake works of improvement provided for in Public Law 566. Wisconsin authorized counties and towns to assist in developing watershed projects, and empowered towns to furnish financial assistance to soil conservation districts.

Thirteen States passed legislation that gives additional authorities to soil conservation districts. California authorized formation of improvement districts within soil conservation districts. Colorado gave soil conservation districts the authority to levy taxes or assessments for watershed improvement or flood prevention. Illinois and Iowa authorized creation of subdistricts within soil conservation districts. Oklahoma gave soil conservation districts the power of eminent domain in acquiring lands needed for upstream flood control.

Eight other States, Kansas, Minnesota, Nevada, New Hampshire, Tennessee, Vermont, Wisconsin, and Wyoming, broadened the powers of soil conservation districts to act as local agencies under the provisions of Public Law 566.

Five States passed legislation pertaining to watershed districts. Minnesota and Tennessee authorized creation of watershed districts, and Nevada authorized formation of watershed protection and flood prevention districts. Kansas and Nebraska amended existing watershed districts laws.

Five States passed legislation pertaining to other kinds of districts. Connecticut amended laws relating to flood control and shore erosion to provide for organization of flood and erosion control districts. Delaware and Mississippi amended drainage laws to give drainage districts authority to carry out flood prevention projects. Wyoming authorized creation of flood control districts. Texas created three new districts, the York Improvement District, the Atacoosa and Frio Counties Improvement District, and the Trinity River Authority.

Many of the 28 States that did not pass legislation in 1955 are studying existing laws to determine whether additional legislation should be considered during the 1956 and 1957 legislative sessions.

BELLE BURCHELL used to attend meetings of the Nantucket (Mass.) Soil Conservation District board of supervisors because she wanted to. Now she also attends because she "has" to. She's secretary of the board. She's one of a score of women included in the 13,000 supervisors who rule the nation's soil conservation districts.

Belle (Mrs. Gilbert E.) Burchell has been interested in farming since she was a girl on her parents' Cape Breton, Nova Scotia, farm. When she moved to Nantucket, that peaceful little island south of Cape Cod, her interest continued.

The Nantucket Soil Conservation District, formed in 1949, was the first farm body on the

Belle Burchell.

island and is still the only one. Supervisors' meetings therefore became an agricultural town meeting. Authorities on various farming subjects were brought in from the mainland as speakers.

The meetings were more than sessions devoted to routine business. Many farmers came not only to learn how the affairs of their district were being run but also to increase their knowledge of farming by listening to the imported specialists. Many other islanders not directly engaged in farming came to "keep up" on agriculture—including Mrs. Burchell. In the back of her mind was the thought that some day she would farm.

Then came election to fill a vacancy on the board of supervisors. Belle Burchell won without a contest, and was quickly selected as secretary.

Mrs. Burchell brought to the board that smooth efficiency that sometimes only a woman can attain. Her minutes are precise, her records always in order. She helps keep business moving along. Her sense of humor is lively.

Mrs. Burchell looks forward to getting into farming on her own. A few years ago her sister, Mrs. Barbara MacLean, bought a 45-acre place on Nantucket. She signed an agreement with the district to apply all the conservation measures needed to improve the land and protect it from erosion. Now she is waiting for Mrs. Burchell and her husband, a professional fisherman, to join her in operating the place. They plan to grow fruit, berries, sweet corn, early potatoes, and peas.

"The summer residents are glad to pay a premium for garden-fresh fruits and vegetables," Mrs. Burchell says. "I'd like to grow things for them. One of these days my husband will tire of the sea. Then we'll all settle down to farming. That will be a happy day for all of us."

—LESTER FOX

A Nursery Saves Soil and Labor

By C. EDMUND ANDERSON

THE pioneer nursery in Nebraska was also a pioneer in the field of soil and moisture conservation.

Marshall's Nursery is located in the town of Arlington. It was conservation minded from the beginning. Each spring surplus bundles of nursery stock were used as gully checks. Terraces shaped like half moons, made with a walking plow and horse, were built on the downhill side of each tree in the orchards to collect water and stop erosion. The ends of these terraces overlapped so that a rather effective job was done. Tillage implements were raised when small gullies were crossed.

Note.—The author is work unit conservationist, Soil Conservation Service, Blair, Nebr.

This lath house has 75,000 coniferous plantings.

How they got started on a complete soil and moisture conservation program can best be told by Vernon Marshall, vice president, and Keith Meier, general production foreman.

"Our 95-acre apple orchard which had just reached full production, was destroyed in one night by one of the most severe storms ever to hit this area. The fall of 1940 had been mild. On the eve of November 10, it began to rain. By midnight the wind changed to the north and on the next day the temperature was well below zero. We knew that the damage to our fruit trees would be terrific but it was not until the next spring that we realized that all the trees were either dead or would die. It was while making the tree survey the following spring that we saw the terrific soil loss that had been going on and knew immediately if the orchard was to be replanted a soil and moisture conservation program would have to be installed.

Thus it was that Marshall's Nursery started a program of soil and moisture conservation on 330 acres of farmland and 200 acres of nursery stock.

Vernon Marshall contacted the Soil Conservation Service and asked assistance. The first problem was the removal of thousands of dead apple trees. In the fall of 1942 the first terrace lines were laid out. In the old orchard there had been an irrigation well. Now there was no need for its services, but the terrace lines were laid so that the new orchard could be irrigated. Forty-two acres of the old orchard were terraced and replanted, the remainder being set aside for cultivated crops.

Difficult as was the removal of 95 acres of dead trees and the leveling and terracing of the land, it was nothing as compared to installing a conservation program on 200 acres of living nursery stock. The trees varied from 3 to 15 years old, and they were set in square plantings of 150 square feet each. The first terraces were built in 1944 in a small field as sort of a trial run. The advantages of this type of planting were noticeable immediately. According to Keith Meier: "There was no soil loss during heavy rains and the planting scheme saved labor. The terrace channels were used

Meier inspecting growth on one of the plots.

as roads and in loading it was necessary to carry the trees only half as far as had been necessary with the old block planting method." Thus in the next 10 years, 200 acres of block planted trees were converted into contour plantings.

The soil loss from a nursery is great although there may be no erosion, says Meier. The balling and moving of thousands of trees each year removes tons of soil. Consequently, says Meier: "We must carry out a good crop rotation that will keep up our soil fertility." The primary rotation used between plantings of nursery stock is 1 year of small grain followed by 2 years of meadow. Soybeans are also used as green manure crop.

The land used for the production of grain and hay also has a complete conservation program.

A conservation program also is being installed on an additional tract of 240 acres which was rented recently.

Conservation is a must on this rolling land and the Armistice Day storm of 1940 may have been a blessing in disguise, Meier thinks, for it made necessary an improvement in soil management and made possible a saving in labor.

Soybeans are an important crop in the rotation.

Small saw mill at work in Maryland.

Woodland management cutting on a Delaware farm.

Snaking a log out of the woods to where it can be picked up by a truck.

A message from an old hand in the Soil Conservation Service.

Farm Wood Crops

By JOHN F. PRESTON

VERY shortly now 10 years will have passed since I retired from the Soil Conservation Service. Retirement, I find, makes one a little more tolerant and perhaps gives a better perspective of some of the problems and some of the opportunities. I want to talk to the Soil Conservation Service about an opportunity for service.

Farm planning in the Soil Conservation Service includes the woodland, but there are many difficulties in getting farmers to accept wood as a farm crop. Hence the progress is very slow. The Service is struggling with the same obstacle that has beset the farm forestry program from the beginning. This is the fact that agriculture does not recognize wood as a farm crop or even growing it as a farm activity; and farmers, like people in other activities, fol-

Note.—The author was chief, forestry division, Soil Conservation Service, Washington, D. C.

Black oak log measuring 21 inches in diameter, on farm near Springfield, Ohio. Trees protect the land from erosion and produce a valuable crop.

low the precepts of agricultural teaching. There is no proper foundation for a "farm forestry" program and until one is built, the farm planners like the forests who have struggled independently for 50 years, will also fail.

The real problem is to get wood accepted as a farm crop, and growing it accepted as a farm activity.

"The basic truth that farm forests can be managed and wood grown as a farm crop, thus enabling the nonarable land to assist the arable land to produce a farm income, has never been fully grasped in all the history of American agriculture." [1]

Ah! there is the rub. Wood is not a farm crop. Farmers do not so consider it. Schools of agriculture do not teach that it is. Agronomists, engineers, and other technicians made

[1] From Developing Farm Woodland. By John F. Preston, 1954. McGraw-Hill Book Co., New York. N. Y.

into farm planners do not get this idea across to the farmers, and many foresters are still foggy about it. They are too apt to think in terms of commercial forestry, meaning stumpage sales at 10-, 15- or 20-year intervals.

Now let's see what is actually meant by wood as a farm crop. In my opinion here it is in four categories, and very simple.

1. The farmer must become the manager of his woods. He may seek advice and technical help from others but he remains the manager of his own woods.
2. He must cut and sell processed products. This gets away from stumpage sales, which must be the exception rather than the rule.
3. He must cut wood products every year. Not always saw logs but the habit of annual cutting keeps familiarity with the woods and gives the needed experience.
4. He must use farm labor insofar as possible for woods work.

This is what I think we mean by "wood as a farm crop." It is more of a creed, a concept, an idea, than it is a forestry program. Even if the farmer knows little or nothing about silviculture and follows those four rules he will not go far wrong. He is bound to get interested, and he will seek and find the technical advice that he needs to make a success of his woods work. If the rules are followed, wood will automatically become a farm crop.

The Soil Conservation Service prides itself upon the unity approach to the farm problem. The farm is the unit, and a corollary of that is that all farm acres should contribute to farm income. Yet how often in the past, in planning farm conservation programs where the woodlands constitute an appreciable part of the farm, do we forget that simple truth. The opportunity of the Soil Conservation Service with its program for farms as units is to get wood included as an agricultural crop. If the concept of wood as a farm crop can become established in agricultural teaching and agricultural lore, the technical part of the job would be quite easy.

This, then, is the opportunity of the Soil Conservation Service: to render a service to farm-

(Continued on page 140)

Salem Pilot Watershed

By JOHN GRANT

NOW there will be fewer wasteful flash floods and recurring droughts to harass the city of Salem, W. Va., its business places, homes, and farmland. Their conquest constitutes one of America's best success stories in dealing with upstream watersheds.

There are three basic reasons for the steady progress in the Salem pilot watershed project:

1. The local will and know-how to defeat the problems of flood and drought.

2. The size of the 5,325-acre watershed, which has permitted a high degree of upstream flood prevention at small cost.

3. The partnership between local, State, and Federal agencies on watershed problems.

Long before Congress appropriated $5 million for the pilot watershed program in 1953, Salem residents had been girding for battle with the ugly forces of nature on a rampage. The largest flood on record damaged 73 urban houses and 61 business places at a cost of about $233,000 in 1950. This came shortly after the second worst flood in 1947. Minor inundations resulting from intense rainfall caused some damage every year, arriving on short notice and frequently in the summer.

Even worse than flooding has been the loss of an estimated 23,000 tons of soil material each year since the land was first cleared some time before the Civil War. In addition, a shortage of water has been an acute problem for the city for many years. Water demand has been increasing beyond the capacity of deep wells to supply emergency needs through recharge by the relatively impermeable residual soils. The last three drought years in 1951, 1952, and 1953 made it necessary to curtail water use sharply.

Note.—The author is manager of the Upper Monongahela Valley Association, a 10-county watershed development organization in Northern West Virginia, Peoples Building, Fairmont, W. Va.

(Continued on page 138)

Use of Herbicides in Conservation

By W. C. SHAW and Marion W. PARKER

WEEDS are pests that most farmers cannot afford. The losses caused by weeds on farms in the United States have now reached an estimated 4 billion dollars annually. These losses are estimated to be second only to farm losses caused by soil erosion.

Weeds compete with crops for water, light, and mineral nutrient. They increase the cost of labor and equipment, reduce the quality and quantity of farm and livestock products, harbor insects and diseases, and impair the health of livestock and humans. Some weeds are especially competitive. The average ragweed plant has a water requirement three times that of corn. One plant of common mustard requires twice as much nitrogen, twice as much phosphorus, four times as much potash, and four times as much water as a well-developed oat plant.

Economical, practical, and effective weed control is essentially a part of planned soil and water conservation and a necessary requirement for successful farming.

An important objective of the research program of the Department of Agriculture is to develop weed control principles and practices that will result in reducing the losses caused by weeds.

Weed investigations include studies on cultural, ecological, chemical, mechanical, and biological methods of control. There are four broad general areas of work: (1) Research on the evaluation of chemicals for their herbicidal

Note.—Both authors are of the Agricultural Research Service, Beltsville, Md.

Figure 1.—Left, no cultivation, weeds controlled by chemicals. Right, weeds controlled by cultivations, but potatoes less vigorous due to root and soil damage from excessive cultivation.

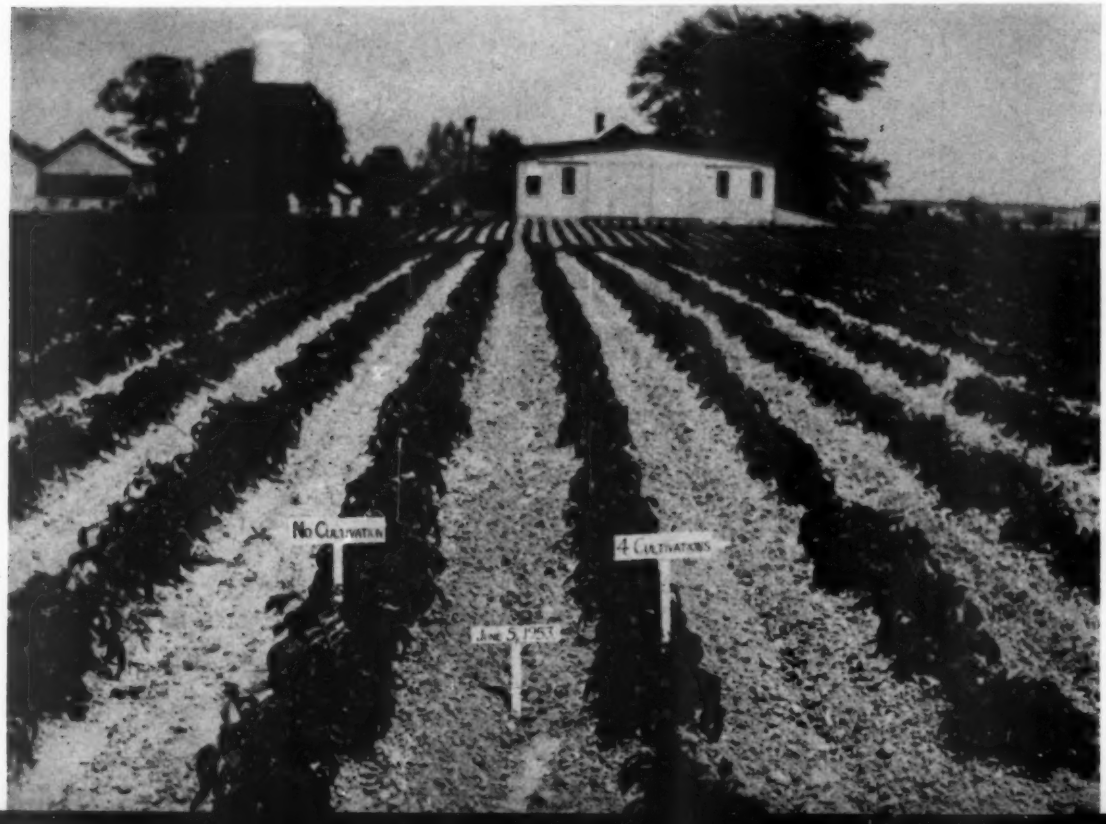


Figure 2.—Left, a pre-emergence treatment of TCA and endothal controlled weeds for 6 weeks, greatly reducing cultivation needed. Right, heavy infestation of weeds in untreated check.

No. 11

This is the eleventh of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

properties, including studies of factors affecting the efficiency of chemicals as herbicides; (2) physiological and ecological studies on weeds and crops in relation to methods of weed control; (3) research on weed control in cultivated crops, including field and horticultural crops on nonirrigated and irrigated lands; and (4) research on weed control in pastures and on rangelands and noncultivated areas. This research is being conducted at 29 locations in cooperation with the Soil Conservation Service, Forest Service, Department of Interior, and 23 State Agricultural Experiment Stations.

In the past decade there have been many significant developments in the control of weeds by chemicals. Some of those most closely related to soil and water conservation include: (1) Reduced tillage in those crops for which satisfactory chemical weed control practices have been developed; (2) chemical treatments as pasture renovation aids; (3) chemical control of brush and weeds as a means of increasing the productivity of pastures and rangelands; and (4) the conservation of water through the efficient control of weeds in irrigation channels and drainage ditches and on ditchbanks.

How does the use of herbicides aid in soil conservation? A 3-year cooperative investigation on cultivation and weed control practices in potatoes conducted by R. J. Aldrich, field crops research branch, Agricultural Research Service, U. S. Department of Agriculture, and G. R. Blake and J. C. Campbell of the New Jersey Agricultural Experiment Station help supply some of the answers.

Potatoes are intensively tilled in the Eastern United States. Tractors and other equipment are used from March to October. During that time the soil may be plowed and harrowed several times before planting. After planting,

Figure 3.—Left, untreated. Right, a pre-emergence application of an ester of 2,4-D at 2 pounds acid equivalent per acre gave excellent weed control and eliminated the need for the first two cultivations. These and other studies indicate that effective chemical weed control can greatly reduce the amount of cultivation required for maximum corn yields.

ridges are harrowed off, potatoes are cultivated 4 to 8 times, sidedressed, sprayed 5 to 9 times, and sometimes chiseled. Vines are killed by spraying or beating, potatoes are dug and hauled. Finally the field is disked and planted to a cover or other crop. These operations result in about 20 to 25 miles of travel on each acre in a season. This is intensive farming.

The use of herbicides makes it possible to reduce this traffic by reducing the amount of cultivation needed to control weeds.

In the research studies, the yield of potatoes varied with the number of cultivations and the extent of damage to soil and crop from excessive cultivation. The results indicated that when herbicides were used to control weeds not more than two cultivations were required for maximum yields. Yields were actually lowered by excessive cultivation in 2 out of 3 years. In these studies the herbicide DNBP (4, 6-dinitro ortho secondary butyl phenol) as a pre-emergence spray controlled the weeds for 4 to 6 weeks after potato emergence, eliminating the need for cultivation during this period.

Any traffic or machinery on soil tends to compact it. This is also true of cultivators. Although the cultivator loosens the surface soil, that in the root zone is actually compacted by the machinery. During the 3 years of this study, soils that were cultivated once had an average weight of 95 pounds per cubic foot, whereas those cultivated 5 to 7 times weighed 98 pounds. One hundred thirty thousand extra pounds of soil were packed into the surface foot of each acre.

It is not merely the packing of soils that is detrimental to plants growing in them. Other effects accompany the compaction. Air space, for example, is reduced. The part of the soil filled with air is a measure of aeration. It is the space through which plant roots get oxygen from the atmosphere and through which carbon dioxide filters out of the soil. Five to seven cultivations reduced the soil air space by 15 percent in the 2 years of measurements.

Compacting wet soils also crushes and destroys soil granules or aggregates of particles. When these are destroyed there is increased tendency toward muddiness of the soil when wet, and crusting and cloddiness when dry. Aggregation tests on many samples showed that minimum cultivation left the soil in better tilth.

It should be pointed out that wet soil is compacted much more easily and to a greater degree than dry. Most potato cultivation normally is done in early spring when soils are relatively wet. Pre-emergence spraying with chemicals not only saves labor and cost of cultivating but makes it possible to stay off the land for 5 to 6 weeks after application. This is precisely the time when greatest damage usually occurs from cultivation. The cultivations that were found necessary were needed later in the growing season when the soil was usually drier.

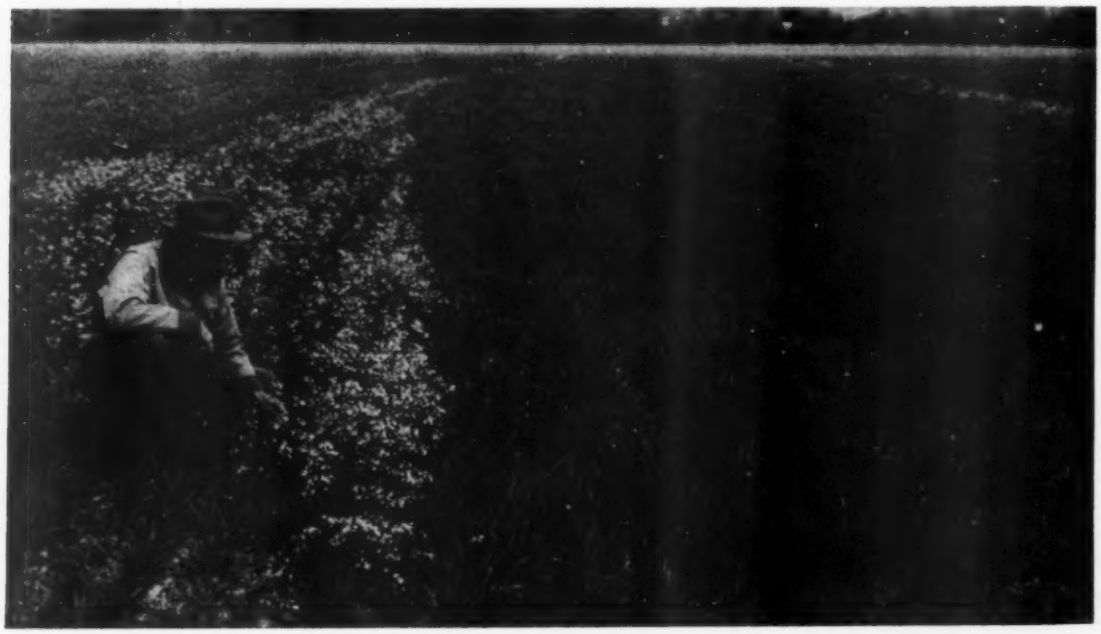


Figure 4.—Left, untreated oats heavily infested with mustard. Right, an amine salt of 2,4-D at one-fourth pound acid equivalent per acre has given excellent control of mustard. The per acre cost of the herbicide for this treatment was 25 cents.

Figure 5.—A low volatile ester of 2,4,5-T being applied for the control of weeds and woody plants on an irrigation ditchbank.

It is believed that the reduced potato yields which resulted from 5 to 7 cultivations were a direct result of damage to the soil structure and to potato roots. The damage to soils is not corrected simply by plowing the next year. It is cumulative. Loss of soil productivity by damaged soil structure is corrected slowly and only with the greatest care in applying good soil management practices such as rotations, cover crops, and proper tillage.

This is but one striking example of the relationship between chemical weed control, good soil management, and soil conservation. The use of preplanting and pre-emergence herbicides for the control of weeds is also making it possible to plant and grow corn, sugar beets, and other crops with less seedbed preparation and with fewer early cultivations.

The increased effectiveness and lower cost of some of the newer herbicides have resulted in the development of a new principle in pasture renovation. Low rates of sodium trichloroacetate (TCA), sodium 2,2-dichloropropionate (dalapon) and 3-amino-1,2,4-triazole and various mixtures of these herbicides with 2,4-D may be used to kill old Kentucky bluegrass sods and other undesirable sods and plants, on soils where tillage operations are ineffective, or where critical slopes increase the hazards of soil erosion if effective seedbed preparation by tillage is practiced.

The effective use of herbicides to assist pasture renovation makes it possible to replace unproductive or undesirable sods on steep slopes and on stony soils that cannot be renovated by conventional tillage equipment or seedbed preparation techniques. In recent research studies when herbicides were used to kill existing sods, only two diskings for seedbed preparation were required to give highly successful stands of a Ladino clover-orchardgrass mixture, alfalfa, birdsfoot trefoil, and other forage species. When herbicides were not used as renovation aids, 10 to 12 diskings were required for seedbed preparation that gave equally satisfactory forage stands.

Millions of acres of rangelands are being invaded by mesquite, sagebrush, sand sagebrush, shinnery oak, juniper, rabbit brush and other weedy range plants. Herbicides are being used on over 2¼ million acres of pastures and rangelands for the control of weeds and brush. Results of recent studies indicate that effective chemical control of weeds and brush on much of our rangeland would increase the production of desirable forage species 40 to 80 percent. Much additional research is needed to develop control practices for some of these species.

With increased research and the continuous development of more effective herbicides, there will be more opportunities for reclaiming these weedy areas and increasing the productivity of weed and brush-infested rangeland.

Most weeds normally use larger quantities of water in their growth processes than do most cultivated plants. This water is not available for use by economic crop plants and thus there is a serious loss in agricultural production. Weeds in irrigation canals and drainage ditches of the Bureau of Reclamation's 14,075 miles of irrigation systems are estimated to result in a loss of more than 150,000 acre-feet of water each year. Add to this amount another 60,000 acre-feet of water lost annually due to salt cedar and other weed infestations along other irrigation sources such as rivers and reservoirs, and the total value of the water loss probably exceeds 3 million dollars annually.

Project these water losses to all irrigation systems in the western region involving approximately 120,386 miles of unlined canals, and the estimate of annual water loss due to weeds exceeds 1¼ million acre-feet with an annual gross value of nearly 25½ million dollars.

In cooperative research with the bureau of Reclamation, the Agricultural Research Service has developed chemical weed control practices which will aid in reducing the water losses caused by weeds and the cost on controlling weeds.

The use of aromatic solvents and other chemicals for the control of submerged water weeds in irrigation canals in the West is rapidly being accepted as necessary for proper management. Recent research has shown that several new chemicals, including 2,2-dichloropropionic acid and 3-amino-1,2,4-triazole, may prove more effective for the control of cattails, phragmites, and other ditchbank weeds than some of the present treatments.

Farmers have demonstrated outstanding interest in the use of chemicals to control weeds. Herbicides are being applied on an average of 1 out of every 10 acres of cultivated land in the United States. It is estimated that over 85 million pounds of herbicides were used for weed control on agricultural and nonagricultural lands in this country in 1952. Of the total acreage sprayed and dusted for weed, insect, and disease control, more than half was sprayed for weed and brush control. In 1952, a total of 33.5 million acres of agricultural lands were sprayed for weed control, as compared with a combined total of about 29 million acres sprayed or dusted for insect and disease control. The total sprayed for weed control included approximately 18 million acres of small grains (wheat, oats, rye, barley, flax, and rice), 9.5 million acres of corn, 2.5 million acres of pasture and rangeland, and over 2.5 million acres of other crops.

About 70 percent of the acreage sprayed for weed control was treated by farmers using their own equipment. The cost of chemicals on this acreage amounted to about 26 million dollars. On the remaining 30 percent of the total acreage, custom operators furnished and applied the herbicides at a cost of 22 million dollars. Thus, in 1952, American farmers were paying a total of 48 million dollars annually for the control of weeds on their farms. This gives some indication of the use of chemicals and the cost of weed control on agricultural lands. The use of chemicals on nonagricultural lands such as rights-of-way of highways, utility lines, railroads, and industrial and military sites is also a constantly increasing practice.

PUBLIC SERVICE PROGRAM.—Vermont's television station WCAX–TV, operating on Channel 3, with service including neighboring New York, New Hampshire, and Canada, devotes attention to soil conservation regularly as an important part of the agricultural program "Across the Fence." Kenneth Wilson, Vermont state soil conservation engineer, is seen here demonstrating the use of tile in soil drainage while Lloyd Williams, master of ceremonies, looks on. "Across the Fence" is presented as a public service daily at noon, Monday through Friday, with the cooperation of the University of Vermont College of Agriculture and the Vermont Extension Service.

Advisory Committee

MEMBERS of the Soil and Water Conservation Advisory Committee of the Department of Agriculture held their first meeting in Washington October 27 and 28 with representatives of the Secretary's office and Departmental agencies dealing with conservation activities. Assistant Secretary Ervin L. Peterson was chairman.

Seventeen of the eighteen members appointed by Secretary Ezra Taft Benson participated in the sessions.

Committee members were briefed by G. W. Irving, deputy administrator, and Sherman E. Johnson, director of farm and land management research, Agricultural Research Service; Clarence M. Ferguson, administrator, Federal Extension Service; Donald A. Williams, administrator, Soil Conservation Service; Richard E. McArdle, chief, Forest Service; Fred G. Ritchie, acting administrator, Agricultural Conservation Program Service; and Homer D. Cogdell, assistant administrator, Farmers Home Administration.

The committee recommended that the Department seek an amendment to the Watershed Protection and Flood Prevention Act, Public Law 566, that would provide for federal participation in the cost of structures designed to store water for purposes other than flood prevention. The act limits federal cost-sharing to structures designed for flood prevention only.

Assistant Secretary Peterson said the committee would function on a continuing basis, that it would meet on call at least once yearly, that 6 members would serve for 1 year, 6 for 2 years, and the remaining 6 for 3 years.

Membership will be rotated on a geographic basis, he said, so that the original structure of the committee—6 each from the West, Central States, and East—will be maintained and the turnover will be only 2 members annually from each geographic area. The Assistant Secretary indicated that subcommittees could be appointed to make special studies, as the need arises, and report to the entire committee.

Soil and Water Conservation Advisory Committee

Leo L. Anderson, director, Sexauer Seed Co., Fargo, N. Dak.

Earl T. Bower, Wyoming Water Resources Board, Worland, Wyo.

R. Edward Baur, director, National Association of Soil Conservation Districts, Van Meter, Iowa.

Dr. Firman E. Bear, chairman emeritus, Department of Soils, Rutgers University, New Brunswick, N. J.

George D. Clyde, Commissioner of Interstate Streams, Utah Water and Power Board, Salt Lake City, Utah.

Bill Durham, farm editor, Fort Worth Star Telegram, Fort Worth, Tex.

Charles J. Elliott, director, Illinois Agriculture Association, Streator, Ill.

L. W. Garver, chairman, Soil and Water Conservation Committee, Farm Equipment Institute, Racine, Wis.

L. Roy Hawes, Commissioner of Agriculture, Commonwealth of Massachusetts, Sudbury, Mass.

T. R. Hedges, former chairman, Washington Association of Soil Conservation Districts, Waterville, Wash.

Tom Hitch, president, Tennessee Farm Bureau Federation, Columbia, Tenn.

A. D. Holmes, Jr., area vice president, National Association of Soil Conservation Districts, Gallion, Ala.

Mrs. Katherine Jackson Lee, chairman, New Hampshire Natural Resources Council, Peterborough, N. H.

L. L. Males, secretary-treasurer, Washita Valley Flood Control Council, Cheyenne, Okla.

Raymond A. McConnell, editor, Nebraska State Journal, Lincoln, Nebr.

Wade Newbegin, president, R. M. Wade & Co., Portland, Oreg.

William Rosecrans, chairman, California Board of Forestry, Los Angeles, Calif.

Carl Shoemaker, conservation consultant, National Wildlife Federation, Washington, D. C.

SALEM PILOT WATERSHED

(Continued from page 131)

To correct these difficulties, local leaders had hoped to build many farm ponds to provide some measure of flood control but in this they were disappointed. They also had obtained an estimate of about $700,000 for comprehensive channel improvement within the city limits on Salem Fork of Tenmile Creek and Jacob's Run. This was the creek they already had cleaned out once since 1936. After the June 1950 disaster, a spontaneous drive started in Salem and neighboring Bristol, just downstream, and a sum of about $13,000 was raised in 1952. With power shovel and bulldozers, the channel was deepened and widened from below the watershed area through the town to its upper limits.

Shortly afterward the City Council became interested in the possibility of a city reservoir to correct the inadequate well supply, and initial surveys of sites were undertaken in early 1953. More detailed surveys of the most promising reservoir site just up Dog Run, a short distance above the city filtration plant, were undertaken and some of the land was placed under option by the city. The watershed progress to that time, while not rounded out, was sufficient in 1953 to cause the conservation committees of the Upper Monongahela Valley Association and the local soil conservation districts to hold a regional meeting with a tour to publicize the accomplishments. The previous accomplishments, the record of developed leadership, Salem's location on Route 50, and the small size of the watershed were responsible for the selection of the Salem area as West Virginia's first and only pilot watershed later that year. Just previously, Congress has passed a $5 million appropriation to start a watershed program designed to find a middle ground of flood prevention for localized areas upstream and to fill the gap between conservation on the individual farm and the big dam structures on the main rivers.

Problem area: The Salem Fork of Tenmile Creek where Jacob's Run comes under the buildings of Salem, the highway, and the railroad to join it. Before the stream-cleaning in 1952 the channel became blocked with silt and debris to large extent aggravating the flood problem.

Board of Directors, Upper Tenmile Watershed Association, Inc.: Seated—State Senator Walter A. Holden, Kenneth Summers, Secretary Edwin J. Bond, President Herschel D. Wade, Treasurer David L. Nicholson; standing—Vice President Glenn L. Post, and Harley D. Bond.

Action in the Salem Fork Watershed, one of 62 such experimental and demonstrational projects designed to test the practicality of such an approach to flood prevention and watershed protection, started with detailed surveys by technicians of the Soil Conservation Service experienced in watershed questions. They found less than 9 percent of the land to be in Classes I, II, and III, while 34 percent was in Class IV, 39 percent in Class VI, and 18 percent in Class VII. Their intensive study showed neglect of the watershed farmlands, severe sheet erosion, depletion of organic material, with weeds dominant, and poor condition of forest lands due to overgrazing and overcutting of mine prop timber.

The technicians located potential sites for flood detention structures and roughly figured

"Before" picture of the Glenn Post-Clarence Rogers dam site, seen from U. S. 50, 2 miles west of Weston.

"After" picture of the completed Post-Rogers dam; banks are seeded to grass, roadway has been relocated, drainage area feeds dam's pool.

what conservation practices were needed on each farm in the watershed. Then the sponsoring organizations—the West Fork Soil Conservation District and the Upper Tenmile Watershed Association—developed an initial work plan on a 5-year basis which provided for cost sharing.

The principal measures include 7 floodwater detention structures, 2 miles of stream channel improvement, 4 miles of logging road stabilization, 100 acres of tree planting and fencing above the structures. The dams will detain runoff from 1,943 acres, or about ⅓ of the watershed, and there will be 1 structure on each of the 4 subwatersheds, with a total of 5 on Jacob's Run. Another dam, recently constructed, provides the water supply reservoir and was built by the city of Salem at a cost of $128,000.

Land treatment for conservation of water

Board of Supervisors, West Fork Soil Conservation District: Chairman G. Manley Curry, Kenneth Kayser, Chester M. Cunningham, Harley Bond, Ray C. Hudkins, and J. Earl Arbuckle.

and watershed lands, with mostly off-site benefits, provide for improvement of vegetative cover by retirement of steep eroding lands to woodland or wildlife uses and by practices designed to improve the cover.

While less glamorous to the average American than the flood detention dams, these conservation measures reduce runoff, increase infiltration into the soil and hold the water and soil above the dams. Thus, the dams are assured longer effectiveness by protection from siltation. The plans call for 557 acres of tree planting, 450 acres of contour stripcropping, 141 acres of pasture feeding, 3 miles of diversion terraces, 1,645 acres of woodland, protection ponds, and other practices. Farmers, and indirectly city people, already are benefiting from the planting of more than 309,000 seedlings, the construction of 6 farm ponds, the treatment of 431 acres of pasture, and the installation of a sizeable part of the other planned land treatment measures.

By the end of this year 5 of the 8 major structures, including the water supply dam, costing a total of $210,000, will be in operation. Indications are that the height of a severe local flood this last August was conderably reduced. In several other instances of minor storm flows the control work prevented flood damage—this, at times when other cities in the valley experienced severe property damages and even loss of life from uncontrolled flood waters. The apparent success of this cooperative project, in which the Soil Conservation Service, the Forest Service, the Geological Survey, the Weather Bureau, the Conservation Commission of West Virginia, and other agencies each played a significant role, has greatly impressed many community groups beset by similar flood problems.

The Salem pilot project's financing presented problems which are under study. The experience of the Upper Tenmile Watershed Association in obtaining easements and rights of way for flood detention structures pointed to the inadequacy of voluntary money raising.

Despite these financing troubles, which are being experienced by most watershed organizations throughout the country, remarkable progress is being made in the watershed movement. The Salem project was chosen as 1 of 8 evaluation study watersheds in the United States because of its size and its high degree of accomplishments. Invaluable scientific data of benefit to our future watershed knowledge are being gathered. And the story of the Salem watershed project helped win the top 1954 National Conservation Speaking Contest prize of $1,000 and a trip to the San Diego, Calif., meeting of the National Association of Soil Conservation Districts for Clarence M. Rogers, Salem and Clarksburg landowner and attorney.

With ½ to ⅔ of all our flood damages occuring upstream on our main streams, the Salem watershed assumes important in "piloting" other watershed groups to deal successfully with their unsolved problems. Salem's accomplishments in flood and sediment reduction, in correction of severe water supply problems, and in increased agricultural and recreational income provide striking evidences of what can be achieved.

FARM WOOD CROPS

(Continued from page 131)

ers by taking the lead in a campaign to establish wood as a farm crop. The symbolism of agriculture is a subtle thing. It is built up, it grows, it becomes established gradually by intangible steps. But once established, it becomes a powerful force. Wood as a farm crop can become something taken for granted—something that every good farmer will accept as a matter of course.

No agricultural agency has heretofore attempted to put such an idea into agricultural teaching. The Service is in a good position to

do it. It will not be easy. It cannot be done rapidly, but it is the foundation stone of farm woodland work which has never been laid. I call upon the Service to accept this task, to take advantage of this opportunity to get wood as a farm crop accepted and advocated by the fraternity of agricultural teachers and leaders, and through them put into practice by farmers.

Then farm woodland work will take on new meaning in the conservation program; it can become the keystone in the conservation arch. Integrated conservation itself will have a reality now lacking when the woods are not a part of it. A foundation under the farm woodlands becomes part of the foundation under the whole farm conservation program. The latter is thereby strengthened because a presently weak member becomes strong. Forestry can aid the farm conservation program mightily. It is worth helping; it is worth recognizing as a full-fledged member of the agricultural family. This is an opportunity to render a mighty service to agriculture.

UNDERPLANTING PINES.—J. H. Sharp, of Eros, La., a cooperator with the Dugdemona Soil Conservation District in Jackson Parish, hand-planted 22,000 pines on 22 acres of his 95-acre woodland tract. He could not succeed in open fields, so he underplanted his pines in stands of low-grade or worthless hardwoods where the young trees were protected from drought.

Linton Jones, work unit conservationist, demonstrates the planting of a pine seedling with a planting bar.

J. H. Sharp, woodland owner in Jackson Parish, examines a 15-inch seedling following first growing season. This area, hand planted, had hardwood control by girdling.

Planning assistance was given by Linton Jones, work unit conservationist, and there was a 3-man planting crew. Total cost was $12 an acre—$6 for deadening the hardwoods and $6 for planting the pines.

When the stand was examined about 10 months later survival was found to be better than 90 percent, with a height growth averaging more than 12 inches. Underplanting of low-grade hardwoods was successful also on three woodland farms in adjoining Winn Parish.

"This is the only way I could see a future in this timber farm," Mr. Sharp said. "In 4 years, I expect to have my $12 back from increased value of the land."

In this section of the State near Jonesboro nearly all the open field plantings made during the 1953-54 planting season were lost, owing to extreme drought.

One of the first steps in reaching the objective of maximum timber production on every acre of forest land is to have the forest land fully stocked with trees that will produce the most valuable timber products.

In the upland timber sections of the State, where pine is the most valuable species, there are many areas of low-grade hardwood without pine seed trees or pine reproduction. These areas can be started toward maximum production of valuable species by underplanting and deadening.

Underplanting during drought periods results in satisfactory survival because (1) there is less loss of moisture because of lower soil temperature and (2) there is less movement of hot air which would bring about moisture loss.

In open field plantings, on the other hand, the hot air draws the moisture out of the needles of the pine seedlings faster than the roots can replace it. This results in loss of seedlings.

There's no better contest prize than a subscription to this magazine.

AGRICULTURAL LAND RESOURCES IN THE UNITED STATES. AIB No. 140. By Hugh W. Wooten and James R. Anderson. 107 pp. 1955. Washington, D. C.: Superintendent of Documents. 55 cents.

THIS publication examines the nation's land resources available to meet present requirements. It also takes a look at future needs. The facts and estimates presented will be of interest to those concerned with these resources and their conservation.

Projections of recent trends in the development and conversion of land indicate that total cropland—in use or idle—may reach 508 million acres by 1975, an increase of 30 million acres, or 6 percent, over 1950—"if present public programs and related farm improvements go forward at about the same rate as they have done since 1945." It is estimated that one-half or more of this increase will come about through conversion of acreage now in permant pasture to crop rotation. It is pointed out further that, although some permanent pasture goes into the cropland rotation, an increase of about 75 million acres in improved permanent pasture is likely. Total land available for pasture and grazing may decline by 25 million acres, or 3 percent, by 1975. This reduction would bring the total acreage of pasture and grassland down to 925 million acres, if rotation or cropland pasture is excluded.

Total woodland is expected to be maintained at near the present level. Clearing is occurring at a fairly rapid rate in some areas, while reforestation is proceeding in others. The rate of clearing is influenced by the suitability of land for cultivation or pasture. The area of cropland, including rotation pastures, probably will increase because of the development of new land and the shifting of permanent grassland pasture into the cropland rotation. The area of land suitable for cultivation converted to urban, industrial uses, and such purposes as highways, airports, and recreation will continue to increase. (Note: A recent survey by the Soil Conservation Service shows that over a million acres of land suitable for cultivation is being shifted to nonagricultural uses each year.)

Land available for crops rose from 431 million acres in 1909 to 478 million in 1949, with an upward trend continuing. Cropland, idle or in crops, increased from 347 million acres in 1909 to 409 million in 1949. It should be pointed out here that the acreage of cropland harvested to grow feed for horses and mules decreased from an average of 90 million acres in 1910–1914 to 30 million in 1945–49, and at present represents about 78 million acres less than in 1910. There has also been a decrease of 55 million acres of pasture used for grazing horses and mules.

The agricultural acreage used intensively is increasing, but the pattern of land use is also changing. Some of these changes involve (1) a shifting of cash crops, primarily cotton, from the Southeast to the Mississippi Delta, western Texas, and California, this being accompanied by higher yields per acre and higher total production; (2) increases of hay and other feed crops in some regions, resulting in better quality and higher yields; (3) continued increase in acreages of improved pastures and fenced pastures in several sections, along with increase in numbers of better types of beef and dairy cattle and more feeder stock.

Pressure is continuous for conservation improvements. The acreages of improved pasture have increased significantly in all South Atlantic States because of the diversions of cropland and the improvement and development of formerly abandoned fields. Clearing and drainage have added to this increase. The economic advantages of pastures are emphasized particularly in the case of land not well suited to cultivation.

Changes to a more adequate and palatable diet in recent years have meant and will continue to mean a considerable increase in consumption of livestock products, particularly milk and milk products and high grade meats. This indicates a shift to a higher, rather than a lower, per capita acreage required to produce livestock products. Only higher yields from cropland and pasture will offset this need for increased acreages.

Economic and other factors affecting land use are discussed and it is pointed out that "Temporarily large stocks, such as those accumulated in 1948–49 and again in 1952–53 have tended to be evened out because of later fluctuations in production, expanding requirements, and development of better methods of distribution and storage."

Although the total acreage of cropland used for crops has changed slightly since 1920, higher yields per acre have brought materially increased production over the last 20 to 30 years. The authors recognize and emphasize the place of proper land use and soil and water conservation programs in the long time agricultural picture. While there is at times overproduction of some crops, expected buildup of population poses the permanent problem of making the most productive use of our land resources.

—JOHN W. BARNARD

GRASSLAND FARMING. By George E. Serviss and Gilbert H. Ahlgren. 146 pp. Illustrated. 1955. New York: John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16. $2.96.

THIS book is one of the Wiley farm series written for agricultural students, farmers, and farm service employees. There are 12 chapters of interesting subject matter. Well chosen photographs and line drawings help to keep up reader interest and aid in explanations. A list of selected readings and appropriate questions at the end of each chapter guide the reader in search of additional information.

The style of writing is simple and direct. The sentences are short and the meaning is clear. The authors succeed in treating a somewhat technical subject with refreshing simplicity. It invites reader attention from the grades to college.

The subject is broad, covering everything from grass as a crop, a description of selected grasses and legumes, and a discussion of managing pastures and hay crops, to a chapter on equipment that is needed in grassland farming.

Soil conservationists will be pleased to find frequent references to the value of grass in the control of erosion. One complete chapter is devoted to conservation cropping. The statement, "If we could keep our sloping land covered with grass-legume sods, our erosion problems would be largely eliminated," is well supported. In discussing the conservation methods to be employed the authors discuss land capability, crop rotations, contouring, stripcropping, terraces, and grass waterways.

The book makes good reading and leaves the reader with the impression of the little boy who, after drinking the last drop of his favorite drink and noting the bottom of the cup, seems to ask: "Why isn't there some more?"

—A. D. STOESZ

THE AGRICULTURAL REGIONS OF THE UNITED STATES. By Ladd Haystead and Gilbert C. Fite. 288 pp. Illustrated. 1955. Norman, Okla.: University of Oklahoma Press. $4.

THIS new book by two well informed authors tells you where to farm in the United States, what to grow, and how to apply the newest methods and equipment. It is a concise guide giving land values, soil types, leading crops, annual yields, and changing directions in agriculture.

The Agricultural Regions of the United States presents an interesting array of up-to-date factual information on American agriculture and provides useful information on such important topics as:

1. Values of farmland and the factors which determine buying and selling prices.

2. Long-term shifts in American agricultural production; what areas are best suited for certain types of farming and ranching; where not to establish certain programs, and why.

3. Crop and livestock production, by areas and states; their size, value, dependability for income, and marketing.

4. New techniques and equipment and this country's agricultural revolution.

5. Current problems facing the farmer and rancher, what can be done to solve them, and a prediction of what may be expected in the future.

The authors demolish the myth about the *typical* American farm and provide a fabulous amount of information about the diversity in American farming and ranching.

—B. W. ALLRED

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Green are our Pastures

By CARL E. BUTLER

This was the winning essay in the 1954 New England Green Pastures Contest. The author is a 15-year-old lad of Lenox, Mass. His father is a cooperator with the Berkshire Soil Conservation District.

THE green pastures forage program is keeping us in the dairy business. Better pasture and forage enable us to produce more milk at less cost. In these times of high grain costs and low milk prices, milk can be produced most economically on large amounts of high quality roughage and a small amount of purchased concentrates.

When we moved to our present farm 7 years ago, there were no legumes. In fact, there was nothing but wild grasses growing in the heavy meadowland. The previous owners had sold all the cow manure to gardeners in a nearby city. They had made no attempt at reseeding or topdressing. On the entire farm we didn't cut enough hay to winter our 13 registered Jerseys. By following the green pastures forage program, we have brought the farm to the point where it produces enough roughage for our present herd of 50 head. Moreover, our roughage program is still improving.

Soil tests showed that we needed about 3 tons of lime to the acre to bring it to the proper pH for legume crops. We also found that ladino clover grew very well on our heavy meadowland. Because of our heavy soil, most of our seeding is done in early August. The field to be seeded is plowed after a cutting of hay is taken off. A fine seedbed is prepared and about 3 tons of lime and 400 pounds of 10-10-10 commercial fertilizer are applied. A mixture of timothy, alsike and ladino is seeded with 2½ bushels of oats per acre.

When the oats are about 6 to 8 inches high, they make very good late summer or early fall pastures. The oats then winterkill and the next summer we have a good field of hay. Our permanent pastures provide our cows plenty of feed in the spring. The herd is rotated around these pastures until we get a cutting of hay from the meadows. After topdressing with about 300 pounds of 0-20-20 per acre, the meadows provide summer grazing as needed. In the late spring the young stock are put into the back pasture. As the grass gets short, the animals that are to freshen in the fall are put with the cows.

This year we plan to plant a few acres to millet so that more of our clover can be saved for second cutting of hay. In addition to supplying summer grazing, the millet will act as a smother crop, killing out the old sod before reseeding. In some of the real wet spots we planted a mixture of Reed's canarygrass, timothy and clover. On this land 300 pounds of 10-10-10 were applied before seeding.

The weaving and curving Housatonic River forms the west boundary to our farm. This leaves several points jutting out into the river. On these points we planted ladino and timothy, using 300 pounds of 10-10-10 fertilizer and 3 tons of lime to the acre. On all the land that we seeded we used about 15 pounds of the ladino-timothy mixture to the acre.

My father feels that most of our land is too heavy for alfalfa. However, we seeded some of our dryer land with alfalfa-brome mixture last fall. We used 3 tons of lime and 400 pounds of 0-20-20 to the acre. Although it is still too early to tell how successful this seeding will be, we are hoping that we will be able to work alfalfa into our roughage program.